
We are wise enough to hide: incidence of impacted tooth excluding third molars- a retrospective study

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Abstract: Tooth eruption is a process whereby the forming tooth migrates from its intraosseous location in the jaw to its functional position within the oral cavity. A variety of eruption problems arise during the transitional dentition period and one such problem is ectopic eruption. Ectopic eruption is a disturbance in the usual course of tooth eruption which may lead to impaction of the said tooth. This study sheds light to all impacted teeth in the oral cavity excluding third molar teeth. The aim of this study is to determine the frequency of impacted teeth excluding third molars that need surgical removal. This is a single centre retrospective study done from June 2019 – March 2020. Out of 786 patients who underwent surgical removal of their impacted teeth, 51 patients were considered for the study based on the inclusion criteria. The parameters examined and processed with relevance to impacted teeth were type of impaction based on tooth and its location of impaction, age and gender of patient. IBM SPSS Version 20 was used for statistical analysis. The most common tooth of impaction excluding third molar impactions was canines accounting for 51% of the total cases. There was a definitive predilection for male over females on the incidence of ectopic impactions (64.7%). The association of age of the patient and tooth of impaction revealed the incidence of canine impaction in the age group of 11-20 years and Para molar impactions in the age group of 21-30 years, which is statistically insignificant as $p=0.273>0.05$, by Chi square test. This study concludes to establish the predominance of canine impactions that arise in the age group of 11-20 years with gender predilection in males.

Keywords: impaction; ectopic; canine; paramolar; supernumerary; mesiodens; teeth innovative technique

INTRODUCTION

Tooth eruption is a process whereby the forming tooth migrates from its intraosseous location in the jaw to its functional position within the oral cavity. A variety of eruption problems arise during the transitional dentition period and one such problem is ectopic eruptions. (Yaseen, Naik and Uloopi, 2011) Nikiforuk defined ectopic eruptions as “a condition in which the permanent teeth, because of deficiency of growth in the jaw or segment of jaw, assume a path of eruption that intercepts a primary tooth, causes its premature loss and produces a consequent malposition of the permanent tooth.” (Nikiforuk, 1948).

Failure to treat ectopic eruption can result in loss of arch length, inadequate space for the succedaneous tooth, malocclusion and ectopic impactions. Cessation of the eruption of a tooth caused by a clinically or radiographically detectable physical barrier in the path of eruption, or because of an abnormal position of the tooth defines impaction. (Raghoobar *et al.*, 1991; Hupp, Tucker and Ellis, 2013). The most common impacted teeth are mandibular and maxillary third molars. However, ectopic teeth that fail in eruption are very often impacted. Out of which canine impaction is the most common. Maxillary canines are the second-most frequently impacted teeth after the third molars. (Litsas and Acar, 2011) A canine is considered as being impacted if it is interrupted after complete root development or the contralateral tooth is erupted for at least 6 months with complete root formation. (Işık Aslan and Üçüncü, 2015). Supernumerary teeth, or hyperdontia, is an odontostomatologic anomaly and may be defined as any teeth or tooth substance in excess of the usual configuration of 20 deciduous, and 32 permanent teeth. Supernumerary teeth may occur singly, multiply, unilaterally or bilaterally, erupted or impacted, in one or both jaws, and in the deciduous as well as in permanent dentition. (SCHULZE and C, 1970) The most common impacted supernumerary tooth and the most common impacted tooth excluding the third molars are canines

followed by paramolars. This study will highlight the incidence of impactions excluding third molars and their association to age and gender.

Till date, the institutional team of research has conducted several clinical trials (Christabel *et al.*, 2016)(Jesudasan, Wahab and Sekhar, 2015)(Kumar and Rahman, 2017)(Marimuthu *et al.*, 2018)(Website, no date a)(Kumar, 2017a), in-vitro studies (Kumar, 2017a; Patil *et al.*, 2017) and awareness surveys(Rao and Santhosh Kumar, 2018)(Abhinav *et al.*, 2019)(Kumar and Sneha, 2016)(Kumar, 2017b)(Kumar, Patil and Munoli, 2015; Kumar, 2017b)(Patturaja and Pradeep, 2016; Abhinav, Sweta and Ramesh, 2019)(Jain *et al.*, 2019) in the field of Oral and Maxillofacial Surgery. Hence, a retrospective epidemiological setup is used for this study in order to highlight the differences in trends among the population.

Our department is passionate about research we have published numerous high quality articles in this domain over the past years (Abraham *et al.*, 2005; Devaki, Sathivel and BalajiRaghavendran, 2009; Neelakantan *et al.*, 2010, 2015; Arja *et al.*, 2013; Ramshankar *et al.*, 2014; Sumathi *et al.*, 2014; Surapaneni and Jainu, 2014; Surapaneni, Priya and Mallika, 2014; Ramamoorthi, Nivedhitha and Divyanand, 2015; Manivannan *et al.*, 2017; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; J *et al.*, 2018; Ravindiran and Praveenkumar, 2018; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Krishnaswamy *et al.*, 2020; Samuel, Acharya and Rao, 2020; Sathish and Karthick, 2020)

This study was conducted to determine the prevalence of various types of oral and maxillofacial impactions excluding third molars and their association with variables of age and gender who have undergone surgical management.

MATERIALS AND METHODS

Clinical records of all patients who attended the Department of Oral and Maxillofacial Surgery between June 2019 and March 2020 were screened. Among these, case records of patients who underwent treatment for impactions excluding third molars were segregated. A total of 786 cases were retrieved for this study. Clinical and radiographical records were comparatively evaluated in this study. Institutional ethical committee clearance was obtained for data retrieval and usage as needed for the study (SDC/SIHEC/2020/DIASDATA/0619-0320)

Case records of 786 patients were examined with photographic and radiological cross verification of data for the elimination of errors which could've aroused in the course of the study. Patients who underwent surgical management for impaction of teeth excluding third molars with preference to the availability of data of age, gender, availability of radiographs (IOPA/OPG, CT, MRI) and follow up reviews were considered in the study. Inclusion of all available data with no sorting process has helped minimize sampling bias and stating applicable validity to the study. Third molar impactions were excluded from the study

Data were collected from the patient information archives. Patient data with absence of radiograph, impacted third molars and patients without follow up review notes were excluded from the study.

Out of a total of 786 patients considered for the study, 735 patients were excluded based on the exclusion criterion. A total of 51 patients were considered in this study. All impactions were surgically managed with standard surgical protocols and treatment modalities. Data were collected and verified by an external examiner and the statistical evaluation was done using IBM SPSS Version 20.

With the dependent variables being age and gender and Independent variable being the impacted tooth. 'chi-square' test was used to find association between the parameters assessed. All results underwent statistical analysis at a confidence interval of 95%.

RESULTS AND DISCUSSION

Out of the considered 51 samples of impacted tooth, according to the age of the patients, impaction of tooth excluding third molars; most impactions were seen in the age group of 21-30 years (39.2%, 20 patients). 14 patients were in the age group of 11-20 years(27.5%) and 33.3% (17) patients had incidence of impacted teeth excluding third molars in the age above 30 years. [Figure 1]

In consideration of the gender, out of the total 51 patients included in the study, 33 patients (64.7%) were male whereas 18patients (35.3%) were female. [Figure 2].

According to the impacted tooth, out of a total of 51 patients considered, 26 patients had canine impactions (51%) out of which 20 patients had canine impacted in their upper arch of maxilla (76.9%) and 6 patients had canine impacted in the lower arch or mandible (23.1%). A total of 9 patients had impaction of second molars (17.6%) and 8 patients had impaction of supernumerary teeth which includes paramolars and mesiodens (15.7%). [Figure 3]

On considering the jaw in which impaction of teeth excluding third molars occurred, out of a total of 51 cases, 36 cases occurred in the upper jaw or maxillar (70.6%) and the remaining 15 cases occurred in the lower jaw or mandible (29.4%). [Figure 4]

The association of various types of impactions excluding third molars with age revealed the predominance of incidence of canine impactions in the age group of 11-20 years of age. Out of all impacted teeth in this age group,

canine impaction accounts for 78.6% which was statistically insignificant, p value = $0.273 > 0.05$ by chi square test. [Figure 5]

The association between of various types of impactions excluding third molars with the jaw of occurrence revealed that out of a total of 51 cases, 26 cases were of canine impaction, of which 20 cases accounting for 76.9% were incident in the maxillary where as the remaining 6 cases, accounting for 23.1% were seen in the mandible which was statistically insignificant as $p=0.455 < 0.05$, chi square test. . [Figure 6]

Maxillary canines are the second-most frequently impacted teeth after the third molars (Litsas and Acar, 2011) with prevalence from 0.8-5.2 % (Brin, Becker and Shalhav, 1986; Chu *et al.*, 2003). The incidence of maxillary canine impaction is about 20 times more than mandibular canine impaction (Thilander and Myrberg, 1973). According to the position of impaction, two thirds are located palatally and one third of impacted maxillary canines are positioned labially or within the alveolus (Johnston, 1969).

Eruption is a tightly coordinated process, regulated by a series of signaling effects between the dental follicle and the osteoblast and osteoclast cells found in the alveolar bone (Wise and King, 2008). A wide variety of localized, systemic and genetic reasons may cause disruption in eruption process, ranging from delayed eruption to a complete failure of eruption. (Suri, Gagari and Vastardis, 2004) These failures of eruption when occurring to ectopically placed teeth causes ectopic impactions. Systemic reasons include febrile diseases, endocrine deficiencies and irradiation. Literature does emphasis on the impact of environmental factors on impactions. This may cause impaction during the long, tortuous eruption path of a canine and other ectopic teeth which may lead to impaction. The primary causes of impacted canines are localized conditions and result of one or a combination of following factors (Bishara, 1998) including tooth size and arch length discrepancies, prolonged retention or early loss of deciduous canine, apical periodontitis of deciduous teeth (Yawaka *et al.*, 2002), abnormal position of tooth bud, presence of an alveolar cleft, ankylosis, premature root closure (Acquavella, 1965), cystic or neoplastic formation, dilaceration of root, disturbances in tooth eruption sequence, mucosal barriers or scar tissue by trauma or surgery (Tomizawa *et al.*, 1998), gingival fibromatosis or gingival hyperplasia, supernumerary teeth (Tomizawa *et al.*, 1998; Sekletov, 2001), iatrogenic and idiopathic inclusive of primary failure of eruption. (Proffit and Vig, 1981; Tomizawa *et al.*, 1998; Sekletov, 2001)

If no physical barrier can be identified, the cessation of eruption of a normally placed and developed tooth germ before emergence is described as primary retention (Raghoobar *et al.*, 1991). Generally genetic etiology is related with primary retention (Raghoobar *et al.*, 1991; Bishara and Ortho., 1992). If the teeth become impacted due to an obstruction of the eruption pathway such as crowded dental arch, it is defined as secondary retention (Bishara and Ortho., 1992).

Recent studies conducted are in par with the results we obtained from this study stating maxillary canine impaction occurs in the general population have indicated a prevalence from 0.27% in a Japanese population (Takahama and Aiyama, 1982) to as much as 2.4% among Italians (Sacerdoti and Baccetti, 2004).

Other studies when based on the gender predilection have state against our finding in which the condition affects female patients 2.3 to 3 times more frequently than males. (Johnston, 1969; Becker, Smith and Behar, 1981; Oliver, Mannion and Robinson, 1989; Sacerdoti and Baccetti, 2004). According to Ericson and Kurol *et al.*, Maxillary canine impactions occur twice as often in females than in males (Nieri *et al.*, 2010) and only 8% of canine impactions are bilateral. (Ericson and Kurol, 1988).

Supernumerary teeth can be found in almost any region of the dental arch. (Garvey, Barry and Blake, 1999) Studies have proved to be in sync with the results of our study as they have a striking predilection for maxilla over mandible. They are most frequently located in the maxilla, where 80% of all supernumerary teeth are found. Table 1 demonstrates the prevalence and frequency of supernumerary teeth. (Website, no date b; Zhu *et al.*, 1996; Leco Berrocal, Martín Morales and Martínez González, 2007; Singhvi, Nambiar and Shetty, 2013)

However in the midst of all the uncertainties and questionable origin and cause of ectopic impactions and impactions of teeth other than molars, predictability will help in rightly predicting, eliminating and treating impactions that arise in the oral cavity.

FIGURES

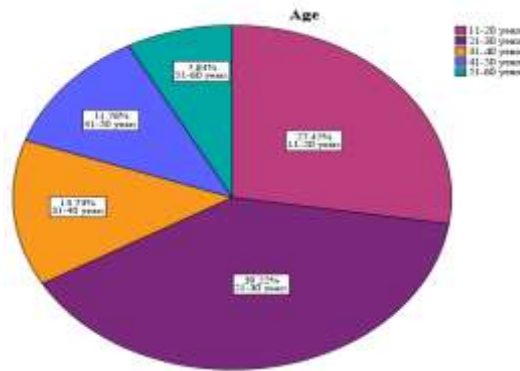


Fig.1: Pie chart showing percentage of incidence of tooth impactions excluding third molars based on different age groups. Patients within age group 21-30years showed the highest incidence rate of 39.22% (violet) followed by the age group of 11-20 years (pink) and 31-40 years (yellow) with an incidence of 27.45% and 13.73%. The least incidence rate was for the patients within the age group of 51-60 years (turquoise) and 41-50 years (blue) with a rate of 7.84% and 11.76% respectively.

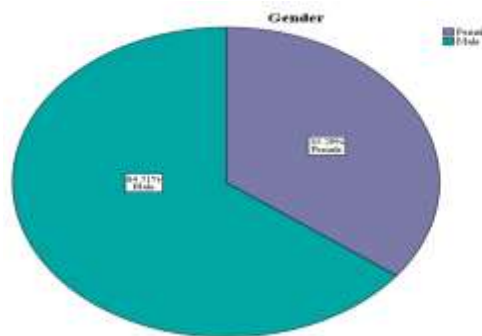


Fig.2: Pie chart showing percentage of incidence of tooth impactions excluding third molars based on gender of the patient. Incidence in males were more than half of the study population (64.71%) (blue) with incidence among females at a rage of 35.29%(Grey)

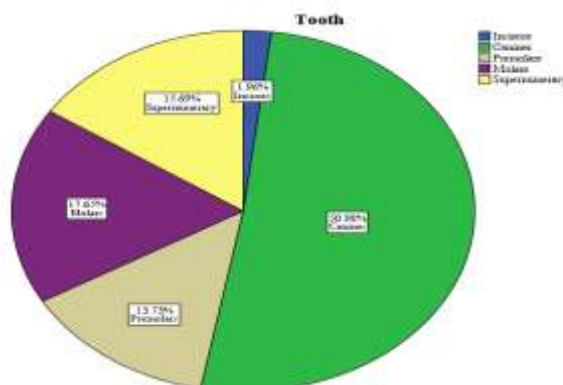


Fig.3: Pie chart showing percentage of incidence of various impacted teeth. Most common tooth to be impacted excluding the third molars are the canine (50.98%) (Green) followed by second molars (violet) and supernumerary teeth (yellow) including paramolars and mesiodens (17.65% and 15.69% respectively). The lease incidence of impaction was seen with incisors (blue) and premolars (Beige) with an incidence rate of 1.96% and 13.73% respectively.

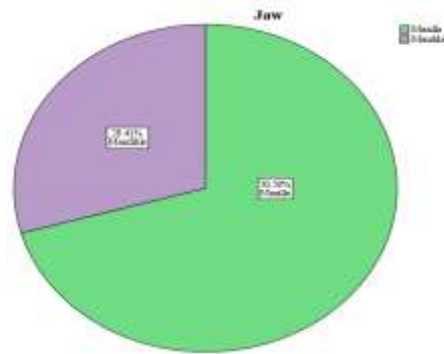


Fig.4: Pie chart showing percentage of incidence of various impacted teeth based on the jaw of occurrence. Most common jaw for the impaction of teeth other than third molars are the maxilla (Green) accounting for 70.59% of cases followed by mandible (Violet) with 29.41% of cases.

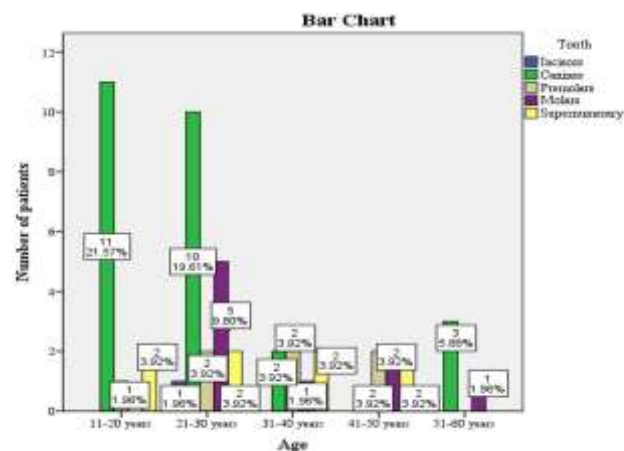


Fig.5: Bar graph showing association between age and the impacted tooth. X axis denotes the impaction seen in different age groups of patients; Y axis denotes the frequency of impaction of teeth; Majority of the impacted teeth occur in the age group of 21-30 years (39.22%). Majority of the canine impactions (green) occur in this age group. However, 21-30 years age groups show a higher predilection to impacted second molars (purple). The association was statistically not significant (p value = 0.273; p > 0.05) using chi square test.

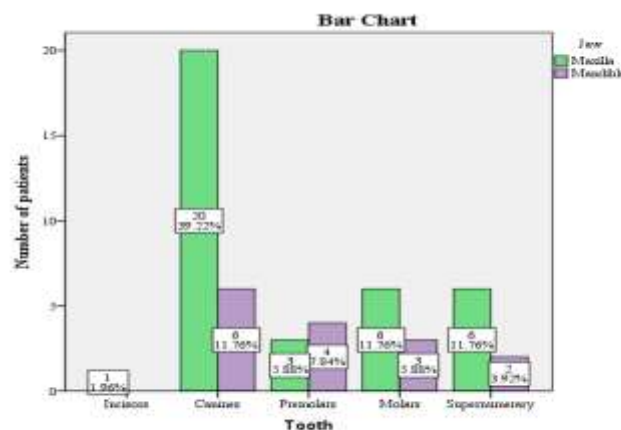


Fig.6: Bar graph showing association between impacted tooth and the jaw of occurrence. X axis denotes the impacted teeth and Y axis denotes the frequency of impaction. Majority of the impacted teeth were canine of which 39.22% occurred in the maxilla (Green) than 11.76% which occurred in the mandible (Purple). All impacted teeth considered excluding the third molars were seen predominantly in the maxilla except for premolars which showed a higher rate of incidence in the mandibular arch (7.84%). The association was not statistically significant (p value = 0.455; p > 0.05) using chi square test.

CONCLUSION

This study concludes to establish the predominance of canine impactions that arise in the age group of 11-20 years with a male gender predilection and occurrence of higher cases in the maxilla when compared to the mandible. This is in consensus with most available evidence. However, considering the smaller sample size, the results cannot be generalised to a larger population. Hence larger sample size and multicentre studies are needed to understand the incidence of impactions in this geographical location.

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